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9 April 1984

# USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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9 April 1984

## USSR REPORT

### MACHINE TOOLS AND METALWORKING EQUIPMENT

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## INDUSTRY PLANNING AND ECONOMICS

### PARTY CONFERENCE DELEGATES SPEAK OUT ON MISMANAGEMENT, EQUIPMENT DELIVERY

Moscow IZ'ESTIYA in Russian 24 Jan 84 p 1

[Article by N. Matukovskiy, IZVESTIYA correspondent, Brest: "Discipline and Order are Components of Success; Notes from the Brest Oblast Party Conference"]

[Text] Before the conference opened I met with two noted rural leaders in the country--Twice Hero of Socialist Labor Vladimir Antonovich Ral'ko, chairman of the Osnezhitskiy Kolkhoz, Pinskiy Rayon, and Hero of Socialist Labor Vladimir Leont'yevich Beduley, chairman of the Sovetskaya Belorussiya Kolkhoz, Kamenetskiy Rayon. Without being consulted in advance, when asked what they considered one of the main reasons for the high successes achieved by their farms, both chairmen pointed out above all personal responsibility, discipline and strict order.

"One could have a great deal of equipment, raw materials, fertilizer, seeds, capital investments and manpower without achieving the necessary results unless there is proper order and high-level organization. Personal responsibility on the part of everyone, the manager in particular, conscious discipline and model order is what agriculture needs today!" convincingly said V. Ral'ko. "The state gives us all the rest in adequate amounts. We have both funds and people."

The accuracy of this thought and the fact that it is in the minds was convincing confirmed at the Brest Oblast party conference. Whatever topics may have been discussed by the reporter, by Yefrem Yefseyevich Sokolov and the conference delegates, they all agreed on the fact that the main shortage today in the oblast farms is one of individual responsibility for the work from top to bottom, high discipline and "iron" order.

The following example was cited: For the past 8 years the head specialized design bureau for the development of new and updating old machinery and equipment for animal husbandry has been operating in Brest. It has a good technical base and employs 330 people. Yet what are the results of the activities of this specialized design bureau?

During all that time its collective developed and submitted for production no more than three machines...instead of 23 as planned. The 1982 Plan for Scientific Research and Experimental Design included updating the heat generator serially produced at the Brest Agricultural Machine-Building Plant.



Even though the work had not been completed, the SKB [Specialized Design Bureau] reported its completion. It not only reported it but received a 30,000-ruble bonus. Yet the heat generator, which was developed and recommended for production, is inferior to the one currently used in terms of reliability and material- and labor-intensiveness. What kind of "discipline" or "order" could one speak about in this case!

It is most vexing when such "order" is frequently encouraged "from above." A striking example was described at the conference by Nikolay Ivanovich Rosh, Pinsk city party committee first secretary.

Eight years have already passed since the completion of the first part of the plant for forge and press automatic lines but to this day the USSR Ministry of Machine Tool and Tool-Building Industry has still not determined the type of goods this enterprise should produce. The plant did not undertake the production of goods stipulated in the blueprints, for the need for such equipment faded even before the construction of the plant was completed. The ministry issued its latest order on the respecialization of the enterprise in March 1983. This too was of no help.

There is no demand for presses the production of which was organized in accordance with the order. Simply stated, they are unnecessary. According to the plan the plant should produce goods worth 35 million rubles. The ministry is unable to secure orders worth even half the amount. The material losses are huge and the moral losses are no less. The 2,000-people-strong collective does not know what it will be producing in 1984. No one, however, has been held responsible for this, although it was during that period that in his speech at the December Plenum, Comrade Yu. V. Andropov, CPSU Central Committee general secretary, drew most serious attention to resolving the problem of utilizing the production potential and upgrading the work shift coefficient of the equipment.

The delegates to the conference spoke of the fact that many shortcomings are caused by parochialism and poor planning. Nina Aleksandrovna Nevдах, a worker at the Gorynskiy cannery, Stolinskiy Rayon, described the following: their rayon store sells canned vegetables produced by the Kobrin, Ivanovo and Malorita canneries in Bres<sup>t</sup> Oblast. Yet it is precisely such canned goods that are shipped from the Gorynskiy plant to Kobrinskiy, Ivanovski and Maloritskiy rayons. Here again, no one is held responsible for such planning, unnecessary hauling and waste of money.

An amazing disparity exists in the oblast's agricultural production. Whereas Osnezhitskiy, Sovetskaya Belorussiya and some other farms regularly average, year after year, 35 to 40 quintals of grain per hectare and 200-250 quintals of potatoes, dozens of oblast kolkhozes average respectively 15 and 100 quintals. A similar situation prevails in animal husbandry. They operate under roughly conditions similar in terms of material and technical facilities, land and manpower. Yet it is order, discipline and a proper organization of the work which is lacking.

The speakers unanimously agreed that order and organization depend above all on the level of management and the ability and competence of the leader, his

discipline, culture, moral standard and conscientiousness. In his time, Vladimir I'lich Lenin said that if we are to teach discipline to workers and peasants conscientiously we must begin with ourselves. The manager must remember that hundreds and thousands of attentive eyes are fixed on him, for which reason all of his actions, steps and words must be carefully considered and weighed in accordance with his knowledge and conscience. No personal benefits are allowed, for this would force him to grant others even greater benefits.

Yet, as Ye. Sokolov pointed out in his accountability report, cases are still frequent in which the steps taken toward managers who have allowed lack of discipline and even violations of the law and the norms of party ethics, are liberal and applied with attenuating stipulations which have nothing in common with party principle-mindedness. Occasionally the so-called "average" terminology is used which prevents the objective assessment of the actions of one manager or another. Although the plan has failed, it is said that thus-and-such a comrade fell short of the plan. A serious misdemeanor committed by a party member is described as follows: the comrade made a mistake. Yet the action is known to and seen by hundreds or thousands of people.

The director of the Priozernyy Sovkhoz, Baranovichskiy Rayon, butchered a Limousin calf, a rare foreign breed, for a marriage celebration. His action was described as "forgetting to pay for it." However, the very sale of such a calf is criminal!... For quite some time the actions of the chairmen of the Pinskiy and Lyakhovichskiy rayon consumer unions V. A. Stuk and M. Ye. Amelin were not suitably evaluated. These people violated financial discipline, were rude to their subordinates and hired people who had been prosecuted for abuse of official position. Yet the party committees know that cases of lack of discipline and unconscientiousness on the part of managers are exceptional incidents from which proper conclusions must be drawn.

The delegates also pointed out that frequently party committee management is replaced by a flood of paperwork which changes nothing.

Many conference delegates discussed the workstyle of party, soviet and economic organs and the need to bring such work closer to practical life.

Ye. Ye. Sokolov was reelected first obkom party secretary at the organizational plenum.

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CSO: 1823/114

## INDUSTRY PLANNING AND ECONOMICS

### QUALITY CONTROL DATA BASE FOR PRODUCTION MANAGEMENT EXPERIMENT VIEWED

Moscow PLANOVYE KHOZYAYSTVO in Russian No 1, Feb 84 pp 105-108

[Article by F. Rudnik and V. Pil'shchikov, candidates of economic sciences: "Organization of Quality Control"]

[Text] One of the urgent problems in developing socialist economics at the modern stage is raising the quality of production. In the report of the CPSU Central Committee to the 26th party congress and the November (1982) Plenary Session of the CPSU Central Committee it was stressed that the main cause of shortcomings in the national economy is that inertia, and the traditions and practices when the quantitative rather than the qualitative side of the matter was emphasized have still not been fully overcome.

Today, the problem of quality is considered to be one that determines the effectiveness of economic development. It spans a large range of scientific, technological, economic and social questions. Therefore, its solution must be a specific comprehensive program. It is precisely such an approach that is reflected in developing and introducing, in many enterprises of the country, comprehensive quality control systems (KS UKP).

They represent a group of interrelated organizational-technological, social-political, economic, legal and other measures, implemented by enterprise managers and executors for the purpose of the constant and systematic raising of the quality of products at all stages of the production cycle (development, production, treatment and operation).

Planning the raising of the quality of the output according to the KS UPK is implemented by generalized and differentiated indicators. The first include the volume and relative share of production of individual types of progressive products, as well as products of the highest category of quality in the total volume of output; the economic effect and additional costs related to improving the quality of the output in its manufacture and operation.

Differentiated indicators include technical economic indicators that characterize the technical operational properties of a product according to its purpose, its reliability and service life, suitability for industrial production and material consumption. They make it possible to plan the modernization of the manufactured products, introduce new standards and specifications



that regulate the individual indicators of product quality, the use of new materials, processing methods etc. on the basis of mathematical analysis and comparing indicators of product quality with basic indicators, with quality indicators of the best domestic and foreign analogs; they also make it possible to eliminate identified conflicts between consumer requirements of the national economy and achievements of science and technology and defects and conflicts in the existing technical norm documentation.

For the Moscow "Frezer" Cutting Tools Plant imeni M. I. Kalinin the importance of the questions being considered is determined primarily by the specifics of the products themselves, as well as of the production.

Cutting tools manufactured by the plant (drills, taps, cutters, thread-rolling and thread-cutting tools) are used by all sectors of the national economy. With the constant growth of the industrial production in the country, tool consumption increases every year. Increasing requirements must be met to a considerable extent by raising the quality of the tool and its operating life. The cutting tool is manufactured of special kinds of steel (tool, alloyed and hard alloys). Therefore, raising its quality, reliability and life facilitates the saving of scarce metal.

In industrial planning the following plan documents are developed: on the output of the highest category of quality; on the development of science and technology; on introducing progressive technology.

The plans are prepared by the functional services of the plant (technical, production and economical) according to forms established by the Minstankoprom [Ministry of Machine Tool and Tool Industry] and determine the volumes, manufacturing time, labor costs, financing sources and the effectiveness of the planned measures.

Plans formed within the framework of industrial planning of raising the output quality have three period steps -- 5 years, 2 years and one year. They are coordinated and approved by the "Soyuzinstrument" VPO [All Union Production Association].

The quality of intraplant output planning determines specific measures detailing them according to the stages of their execution. They are reflected in intraplant documents -- the plan of technical progress and social development of the enterprise collective which is developed and approved for the year. The plan includes the following sections:

certification and recertification of products according to the highest category of quality;

assimilation of production of new or modernized kinds of products and removal of outdated products from production;

introduction of new and revised standards and progressive technology;

improvement of metrological equipment.

All measures included in the technical progress plan are correlated to the national economic and industrial plans, as well as to the proposals of shops and services of the plant. The technical progress plan sets the order and schedules for executing the individual stages of specific measures and the responsible executors and coexecutors.

In order to increase the effectiveness of the monitoring of the execution of the plan, an automatic data processing system was developed and introduced at the "Frezer" Plant to account for the execution of the technical plan which is a component part of the automated system for enterprise control (ASUP) "ASU-Frezer" functioning at the plant. The monitoring function is provided by a set of programs "Monitoring executor activity" (KID) and makes it possible to implement the monitoring of each measure of the plan and its stages.

A monitoring chart is also introduced. It is issued to each performer and shows the execution of this or that measure or its stage in the technical progress plan. The document consists of two parts. In the first (upper) part, each executor is given certain tasks by the workers of the plant ASUP department in accordance with the technical progress plan. Since the KID program set is intended to monitor the execution not only of the technical progress plan, but also of various administrative documents (orders, instructions, letters from higher-ranking organizations), the monitoring chart includes two particulars: The code and number of the kind of document. In the upper part of the chart are the numbers of the point and subpoint of the technical progress plan, brief content, name of the responsible executor, work completion date, and the names of those who monitor the execution of the task. Then the chart is transferred to the data preparation section of the ASUP department where its content is recorded on a magnetic tape for entering the data into the YeS-1022 computer memory. After that the document is sent to the executor.

The second (lower) part of the monitoring chart consists of coupons in which the execution of the task is certified. The executor must mark the date of the task completion on the coupon and sign it. The completed coupon is sent to the ASUP department for removing the task from automated monitoring.

Daily monitoring of the realization of the technical progress plan is provided by producing a data file on magnetic disks of the YeS-1022 computer memory -- a quality control plan that contains the data in the monitoring chart. At the end of each working day, the following are checked on the computer: dates of task execution and determination of tasks whose execution dates have expired or are approaching.

In the first case, the data is rerecorded in the incompleted task file in the computer memory on the basis of which a monthly statement is issued of overdue tasks. Plant managers take disciplinary action on its basis against the executors of the unfulfilled tasks.

In the second case, the computer issues a reminder card on the execution date of the task (two to five days). If there are any objective causes that make it impossible to execute the task on time, the executor must coordinate a new date in the established order and notify the ASUP department about this.

Automating the monitoring of the execution of the technical progress plan provides the plant administration with effective data that makes it possible to make timely decisions while warning the work executors about the approach of the completion dates of the tasks.

An important role in quality control is played by the indicator that evaluates the work of enterprise subdivisions (production as well as functional). On the one hand, it must generalize all factors that affect the product quality and give a general evaluation of the operation of the enterprise and, on the other hand, provide differentiation of the achieved quality level according to the various factors.

According to KS UKP, a generalizing quality coefficient ( $K_k$ ) is set to evaluate the work on raising the quality of the product. This is determined on the basis of a ten-point system. Moreover, differentiated indicators are assumed as follows: losses from scrap ( $P$ ), complaints ( $R$ ), flawless work released by the OTK [Quality Control Department] on the first presentation ( $B$ ), execution of technological processes ( $N_n$ ) and execution index of the manufactured product ( $I_1$ ).

The differentiated indicators determine the value of the generalized indicator:

$$K_k = 5I_1 + 0.01B - 4P - R - 0.01N_n,$$

where 5, 0.01 and 4 are coefficients that determine the relative weight of the differentiated indicator in calculating  $K_k$ .

Differentiated indicators  $B$ ,  $P$ ,  $R$  and  $N_n$  are calculated according to the following data: faultless products released by the OTK on the first presentation, scrap in production, complaints and violations of and deviations from the technological processes.

$I_1$  is calculated by inspection checks of the quality of the tool according to a previously set plan. Since they are made once per quarter and the volume of data on this is relatively small, the calculations are made by the technical bureau of the OTK.

The remaining differentiated indicators require the processing of large volumes of data and are related to other production and economic processes. These are responsible for the informational relationships between the calculations and the indicators themselves. Therefore, they are a part of the "ASU-Frezer" functional structure.

The basic volume of data needed to solve the problems of accounting for quality is transmitted as a result of solving other problems accounting for the quality in the functional structure of the ASU. Some of the problems are solved to determine the differentiated indicators and others -- to solve the generalizing indicators. Thus, "Accounting and analysis of scrap in production" and "Accounting of faultless release of products to the OTK on the first presentation" are of the first group and "Accounting of output of the highest category of quality" is of the second group of indicators.



Most of the output documents obtained as a result of quality accounting problems contain not only record data but also are partly of an analytical nature needed to identify the reasons for deviation from set planned indicators.

The solution of the problem "Accounting of highest category of quality output" makes it possible to make systematic daily monitoring and do an analysis of the output of products with an Emblem of Quality which makes it possible to compare planned indicators with actual output in terms of cost and quantity. Also provided are a record and analysis of the output of products with an Emblem of Quality for a 10-day period, a month and a year. This is done according to data obtained in the process of statistical accounting of the movement of the output and products in the process of production. This is achieved by having a tag for products of the highest category of quality in the primary document for the statistical account. It is used to provide data for the considered problem. The output document form shows data on the actual output of the highest category of quality products and its ratio in the total volume of output.

Of great importance in quality control are records and analyses of scrap in production, identification of losses from it, as well as causes and offenders, and generalization of this analytical data in order to develop specific measures to eliminate the discovered shortcomings. Precisely this is provided by solving the problem "Record and analysis of scrap in production."

Defect notices are made out by the OTK workers in all cases of scrap. This document indicates, besides the quantitative evaluation, the place where the defect was identified (technological operation), the guilty person and the cause of the defect. Standards were prepared for this purpose at the enterprise to classify causes of defects and the guilty ones involved. The primary documents are processed at the computer center of the plant on YeS-1022 computer and then a set of computer output documents is issued. Of seven forms, four are analytic, giving information on making decisions and taking measures to reduce scrap losses and raise the quality of the products.

The purpose of the problem "Record of faultless product acceptance by the OTK on first presentation" is to achieve high product quality, strengthen technological and production discipline and increase the responsibility of executors for the level of work. At the basis of the problem is a system of faultless manufacture of the product and material incentive to raise the level in releasing the product on first presentation, using statistical receiving monitoring by an alternative criterion. Its most important feature is the qualitative evaluation of the work of each worker, section, shop and collective as a whole. The system sets the order of organizing the work to insure that the product is manufactured according to the design and technological documentation. It specifies that each case of defect, violation of the technological process and return of products due to rejection is considered by the technical and economic managers of the shop within 24 hours. Specific measures should be taken to eliminate such cases.

Shop meetings are held twice a month according to the KS UKP. Reports are given at these meetings by monitoring foremen and technical bureau managers on the execution of set schedules of previous decisions on improving the quality of products, cases of violations of the technological discipline, and persons guilty of specific defects are heard. Every month the chief engineer or his deputy hold plant meetings with materials prepared by the OTK on the basis of data issued by the computer center. Since automatic quality control is based on using the computer, it is possible not only to obtain objective and practical data, but also to provide shops, services and the plant managers with data in the inquiry-response mode. Solving a set of problems in the "inquiry-response" mode makes it possible to obtain, in 30 to 40 minutes, data of interest accumulated and stored in the computer memory on all parameters, for example, for each machine tool operator, individual technological operations, products, production sections and the shop as a whole.

The comprehensive quality control system is based on enterprise standards developed in accordance with state, industrial, and republic standards and other norm documents. It includes all subdivisions and services of the plant that participate in the control and manufacture of products.

A basic standard has now been developed at the plant that determines the basic rules and standards for regulating the quality control functions between individual shops and services. They are subdivided into three parts -- parametric (specific), functional and organizational-labor. The first includes such indicators as design efficiency, reliability, suitability for repairs, ease of manufacture and practicability.

Functional standards envision the implementation of specialized problems of quality control and include functions of forecasting the technical standard, planning a rise in quality, certifying product quality and material-equipment supply.

The organizational-labor group contains sets of standards on organizing the labor activity of collectives and individual workers.

The basic standard also determines the data arrangement of the system, establishes communications channels, kinds and services of data, users and the direction of flows. Quality control software is prepared by computers within the framework of the automated control system of the enterprise.

Quality control is closely related to all kinds of economic activity in the enterprise. Therefore, along with introducing the KS UKP standard, it is necessary to have a comprehensive standard for controlling the plant which would determine the development at the enterprise of stable organizational-technical conditions for highly efficient activity and for raising product quality. Its basis should be GOST 24525-0-80 (control of production associations and industrial enterprises). The standard should include the following: rules for control standardization; requirements that determine its methodology and the design of the control system on the basis of standards, including legal, informational and norm, and rules for the automation of control.



The introduction of such a standard would facilitate clear-cut highly efficient and coordinated interaction among all management organs of the plant.

The development and improvement of the quality control system by developing and introducing a set of standards for the enterprise, and other measures will require certain efforts by all subdivisions and services in the plant. This will help the collective in the successful implementation of the 11th Five-Year Plan period goals.

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## INDUSTRY PLANNING AND ECONOMICS

### MODERNIZATION OF MOSCOW MACHINE-TOOL PLANT DISCUSSED

Moscow EKONOMICHESKAYA GAZETA in Russian No 1, Jan 84 p 6

[Article by M. Makhlin: "Toward New Labor Achievements. News From Moscow Machine-Tool Builders" under the rubric "All-Union Socialist Competition"]

[Text] In 1984, the staff of the Moscow Automated-Line Plant imeni 50-letiya SSSR will increase labor productivity by 4.4 rather than 3.36 percent as planned. Moreover, production cost will be lowered by 0.5 percent through economical use of labor and material resources. This is how the machine-tool builders have answered the party's call.

The staff of one of the leading enterprises in the capital--the Automated-Line Plant imeni 50-letiya SSSR--is meeting 1984 with good spirits. In September, the machine-tool builders accomplished the three-year goal of the five-year plan for output of commodity production, and supplemented it by fully 17 million rubles. The entire increase in production volume was achieved by increasing labor productivity. In the course of the five-year plan, it has increased 23.7 percent.

"We expect to raise labor productivity over 1983 levels by another 4.4 percent, which is more than 1 percent above the year's goal," director V. P. Shcherbak said. "The task is especially difficult for us if you consider the complete revision of the list of products to be produced, and the fairly high base level attained over the last 3 years of work following counterplans. We will lower production cost another one-half percent by intensifying economy measures, and actively assimilating the achievements of science and engineering and progressive forms of labor organization. The goal which the party has added to the plan, mentioned in a speech by Comrade Yu V. Andropov, will be achieved."

The director of the enterprise has every reason to be so confident: the experience gained by the staff during the course of the socialist competition, and resources contained in the counterplan for 1984.

At present, machine tools with computer numerical control (CNC) and processing centers comprise one-fifth of the basic production stock, and nearly one-third of the components are manufactured on them. Both of these proportions will increase. Plans have been made to replace already obsolete machine tools possessing CNC--tools which only recently were considered

innovations. Over half the equipment at the plant is up to 10 years old, and further "rejuvenation" of the machine-tool stock is proceeding apace. Over the last 3 years, the capital of the enterprise has increased by 18 percent, and the yield on investment has grown by 30 percent.

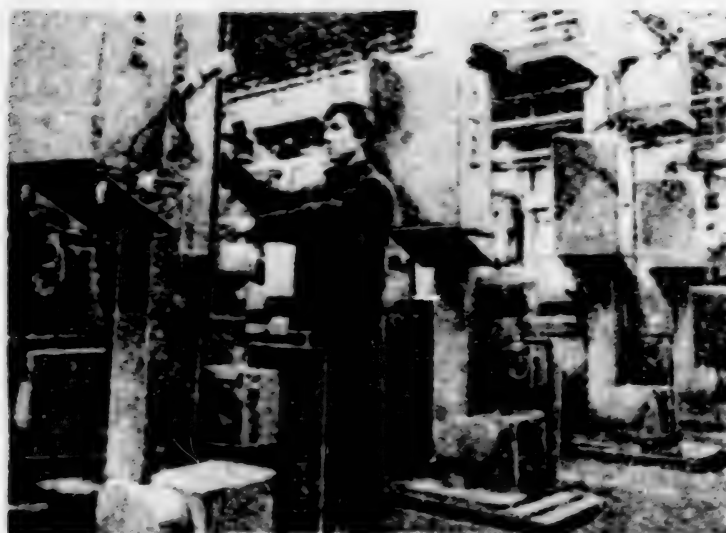
The change to operating the processing centers on a three-shift basis is a significant resource which has been put into practice. Thus far, this highly efficient equipment has been used only for two shifts. There are possibilities for increases in the work-shift coefficient and in other areas.

The skillful assimilation of team forms of organizing and motivating labor is favorably reflected in production efficiency. Today, 70 percent of workers have been united into primary collectives. During the course of the year, this figure will increase to 75 percent. Almost all teams work on a single order, employing KTU [coefficient of labor utilization].

In 1984, out of 51 automated lines scheduled to be manufactured at the plant, 28 will be equipped with programmed controllers run on microprocessors. Tests have shown that the ordinary electronic system faulted up to five times per shift. The new system was tested on a two-shift routine for 1 month--without one slip. This means an enormous gain in labor productivity for consumers--at agricultural machine-building enterprises. The workload ratio of lines like these is growing by 10 to 15 percent.

New frontiers lie ahead. Existing operations producing new models of freight and passenger vehicles will need to be equipped with complexes based on flexible automated systems and labor-extensive technology. Already in the 12th Five-Year Plan, they will be in operation at machine-building enterprises around the clock.

Each percentage of increase in labor productivity of the machine tool builders is augmented many times in the effect it has on consumers. And the staff of the Moscow Automated-Line Plant imeni 50-letiya SSSR clearly understands this. Here, they have passionately supported the appeal from the December plenum of the CPSU Central Committee to carry out the socialist competition for meeting and exceeding the 1984 plan and the goals of the five-year plan on the whole, and for achieving highly productive results.



At the end of 1983, the staff of the Moscow Automated-Line Plant imeni 50-letiya SSSR fulfilled the order from the Tutayev Diesel-Machine Plant, located near Yaroslavl, ahead of schedule. This is a complex of three highly efficient automated lines for processing components of new engines installed in the heavy freight vehicles KrAZ, BelAZ and MAZ, which work under difficult quarry conditions. Automated lines, providing the full cycle of component processing, will replace machine tools with antiquated designs. As a result, the labor of the engine builders will be considerably more productive.

Above: N. Gushchin, one of the best fitters and assemblers, works at his job in the section for assembly of new automated lines.

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CSO: 1823/88

## INDUSTRY PLANNING AND ECONOMICS

### PLANNING, COST-BENEFIT ASPECTS OF PLANT AUTOMATION VIEWED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Feb 84 p 2

[Article by N. Feofanov, chief, Special Designers Buro for Automated Lines and Transfer Machines: "Missed Opportunities"]

[Text] Moscow--Even now in our collective, filling the orders of the Volga and Kama motor vehicle plants is remembered as a significant test. Time has shown that the trials have been successful. For example, automated lines producing 60 cylinder blocks per hour, which have been in operation at the Volga plant for more than 10 years, yield to analagous equipment of leading foreign firms neither in terms of productivity nor of quality of output.

This achievement is very important for us, as in the present 5-year plan we are to raise the productivity of all automated lines under development by one and a half times. In solving this important problem, the designers of the SKB [Special Designers Buro] proceeded in particular to introduce a new arrangement of control by power units. This will allow the time required to position the cutting tool to be reduced by half and, by means of this parameter, make it possible to match the level of the world's best indices. As a result productivity of the automated lines will be raised by three percent. Many will probably be perplexed by the small reward of such efforts, especially if it is compared with the set task. This perplexity will grow still stronger, I think, if one adds that in reducing the time needed to position the cutting tool, the designers are putting into action one of their chief resources for increasing the productivity of the lines.

Does it then mean the problem set before the SKB is beyond our capabilities? It is fully within our capabilities if it is to be solved not by the makers of the lines alone. Let's return to our equipment in operation at the Volga motor vehicle plant. Yes, it surely withstands comparison with advanced foreign models, but under one obligatory condition: that the same cutting tool be used that is used on the analogs. And this is not a peculiarity of the Volga motor vehicle plant. The use, let's say, of only cutters with disposable cutting inserts allow us to achieve, on any of our current lines, a greater effect than that anticipated from the introduction of rapid feed. Advanced designs for the boring tool are capable of increasing efficiency by approximately 10 percent. If one were to analyze the entire array of resources, which would necessarily be brought into action in order to



increase the productivity of our equipment by one and a half times, it would turn out that four fifths of them depend on the tool.

I want to emphasize that until now I have been talking only about what lies on the surface, about what is easiest to grasp. But there is a deeper layer of resources. More and more often situations arise where we, the designers, cannot realize our solutions, as we are bound by the necessity of orienting ourselves to an obsolete tool. I will cite only one example. Automated line 1LZ16 consists of 141 machines. And if it were equipped with an advanced tool, the same productivity--45 cylinder blocks per hour--would be assured by 112 machines. The remaining ones simply turn out to be unnecessary. The result is a savings of 300 tons of metal and 200 kilowatts of useable power, to say nothing of labor expended on manufacturing, freeing of space, increased precision of processing, and other advantages.

So what is the problem? Is it not the task and the obligation of the designers themselves, approaching the planning of equipment, to determine a supply of tools for it, so as to guarantee maximum economic effect? Yes, such is the logic of planning. But under real conditions it frequently breaks down on the first meeting between the designer and the line's customer.

The first automated lines, installed at the Altay motor plant, have served two decades. We, the designers, approached their replacement mindful of the experience of planning closely analogous equipment for the Kama motor vehicle plant, and of other advanced solutions that had appeared in that time. But the customers announced from the threshold, "We rely on you in everything, designers. Only one thing we earnestly request--that the previous tool be used in the new lines."

Attempts to convince the people at Altay that a modern line is not to be founded on a 1960s model tool were not successful; neither were they with many other customers. A paradoxical situation takes shape: On the one hand everyone fights for high-efficiency equipment, and on the other, the same people oppose its development in the most active manner.

The secret of the paradox is simple: According to existing rules, the customer himself must provide the lines with tools. And for this the standard of his tool stock has to be sharply raised. But this is only the first step. Complex and more subtle equipment will require higher qualifications on the part of specialists and workers, improved billets production, and improved organization of labor. In a word I am talking about a whole complex of involved problems, for the solution of which maximum mobilization of forces and resources will be required. And it is perfectly natural that the customer plant will make up its mind to assume these responsibilities only under conditions of the most dire necessity.

And is this always actually necessary? An analysis of the equipment we must design and manufacture in the near future shows that in eight cases out of 10, the customer sets for us a level of productivity that we are fully able

to guarantee by means of traditional solutions and an obsolete tool. But if, at the plant, they are sure of coping with their long-range tasks without any innovations, then it is difficult to count on any kind of initiative or persistence on the part of the customer.

Unfortunately such a position does not receive support. And this is what needs attention. An automated line costs millions of rubles. It is capable of literally transforming the automotive industry and bringing it to the forefront of technical progress. But that same line, if it is approached uneconomically, can do great damage, slowing down the development of the plant for a long time. After all, such equipment serves 15-20 years. These circumstances alone require an especially responsible attitude toward it. Outwardly, this condition is observed: Every line is planned today as a separate element in state planning. However, the fact is that the branch headquarters at times treat it as if it were an ordinary machine, limiting its role to the "beating out" of orders compiled by the plants.

Meanwhile, according to its economic nature, the automated line is an industry-wide tool. Many years of experience show that guaranteeing its rational use exclusively to the enterprise is, as a rule, unsuccessful. All the same it is necessary to enlist the additional strength of the branch. But these efforts might be directed from the very beginning toward developing production of an especially advanced tool, quality billets, and everything necessary. The task is made still easier by the fact that the automated lines devised by our SKB go toward the retooling of plants, mainly those of two ministries, the Ministry of Motor Vehicle Industry and the Ministry of Agricultural Machinery Building. Both have accumulated a great deal of experience in their operation. Cooperation between these ministries and the Ministry of Machine-tool Industry could increase their strength. However, all these opportunities are not put into practice. At a time, let's say, when many types of highly efficient tools do not exist at all, the institutes of three ministries suggest to us as new designs face milling cutters identical in terms of purpose, but all of diverse design. With such lack of agreement and scattering of forces, one thinks that centralized production of the tool, standardized for the equipment we projected, is indeed impossible to establish.

This inattention and discord is costly to the national economy. Even today the application of an advanced tool in limited operations would allow a sharp increase--in isolated instances one and a half times--in the productivity of automated lines. And in the meantime it is used as a unit as it formerly was at only two plants: the Volga motor vehicle plant and the Kama motor vehicle plant. Moreover there is at hand an evident surrender of positions. The tool with the disposable cutting insert has been completely removed at the Taganrog combine plant. Minsk motor plant is also changing over to the soldered tool. But this is a retreat not so much on the part of the enterprises themselves as on the part of the whole industry. Pockets of the best experience and advanced technological culture cannot hold up if they are never to expand. Essentially this experience, its rapid and wide dissemination, is the chief resource for raising the level of our projects.

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## INDUSTRY PLANNING AND ECONOMICS

### PREPARATION OF 10-YEAR MACHINE TOOL INVENTORY STATISTICS ANNOUNCED

Moscow VESTNIK STATISTIKI in Russian No 11, Nov 83 pp 30-32

[Article by I. Yevdokimenko, chief of Statistics Administration of Material-Equipment Supply and Inventory of the USSR TsSU: "Inventory of Machines and Equipment"]

[Text] Among large statistical censuses, an important place is occupied by an inventory of the park of machines and equipment to obtain most important data on the availability and structure of the park of machines and equipment, the technical condition needed to improve further planning of reproduction and utilization of fixed capital.

The census is taken periodically, every 10 years. The next census will be made as of 1 December 1983.

During the past 10 years, the park of machines and equipment in all sectors of the national economy was supplemented by new modern high productivity machines and equipment. This is attested to by data on the scales of machine and equipment production in our country and the achievements of science and engineering. The machinebuilding output increased in our country during this period by two-and-a-half times. During the last 10 years, scientific research institutes, design organizations and industrial enterprises created almost 40,000 new types of machines and equipment of which the major part was put in series production. Every year, the national economy receives over 200,000 metal-cutting machine tools, tens and hundreds of thousands of other machines and equipment of the general plant and technological types; over 11,000 mechanized flow lines and automatic lines are put into action, replacing and easing the labor of a huge army of workers. In the current five-year plan period, machinebuilding output will increase by 1.4 times. "A huge amount of work awaits us on creating machines, devices and technologies for today, as well as tomorrow," stated Comrade Yu. V. Andropov in his speech at the June (1983) Plenary Session of the CPSU Central Committee. "We must automate production, use computers and robots and introduce flexible technology that makes it possible to readjust production for manufacturing new products rapidly and efficiently!"

For the planned inventory census about 2000 of most important groups and items of general plant and technological equipment in all sectors of the national economy were selected. In most cases, the equipment will be counted by type and brand which will make it possible to evaluate its technical level. Thus, in the inventory questionnaire for metal-cutting equipment machine tools with numerical control, "machining centers" and special design are put into a special group. Many machines and equipments in current or annual accounting costing less than 100 rubles will not be inventoried.

The inventory will cover installed equipment, as well as equipment not yet put in operation. In particular, equipment will be taken into account that is in operation in the shops of the enterprises, as well as that undergoing repairs and being modernized, stored and surplus. Of the equipment not put in operation, what will be counted is what is in the process of installation, in a warehouse and a technically needed reserve of its individual types.

At the same time, equipment for sale at supplier enterprises, as well as equipment on the way from supplier enterprises to customers, will not be inventoried. Outdated and writtenoff equipment will not be inventoried.

To take the inventory census, the USSR TsSU [Central Statistical Administration] approved 25 forms.

The national economy imported a considerable quantity of equipment in recent years, therefore, the inventory forms will separate it from the general park of installed equipment.

The composition of the age of the machines and equipment will be given special attention in the census program. All the inventoried installed equipment will be distributed by years of service: up to 5 years, from 5 to 10 years, from 10 to 20 years and 20 years or more, which will make it possible to obtain a detailed age characteristic of machines and equipment in the national economy.

Metalworking equipment is the most important component part of general production equipment, therefore, it is recognized that the program of its inventory must be expanded: data will be obtained on the distribution of metalworking equipment in the most important shops -- basic production, auxiliary production, repairs, tool and other shops.

The inventory will cover all cost accounting enterprises and organizations. According to preliminary data, the reports will cover about 300,000 cost accounting enterprises and organizations of various sectors of the national economy.

To obtain full data on the metal-cutting and forge-press machine park, the inventory will be also taken in the budget organizations on special forms in which consolidated groups of this equipment are called for.



Additional accounting will be made of the daily use of automatic manipulators in all sectors of the national economy on the 15 December 1983. It is planned to obtain data on utilizing installed automatic manipulators at all cost accounting enterprises, at construction sites and other organizations, as well as kolkhozes and interkolkhov agricultural enterprises and organizations. Automatic manipulators that were practically not installed yet on the date of census taking will not be counted.

The program specifies getting data on the number of shifts in which the manipulators are used and their idle times for very important reasons.

A great amount of work is necessary before the start of the inventory in all links of the administration, at enterprises and organizations, as well as in statistical organizations.

With the aid of ministries and departments, managers of enterprises and organizations must make an inventory of all available equipment, check out and put in order all documents on the records for the equipment, check the completeness and correctness of the entries in the record of the technical characteristics indicators and data on the year of manufacture of the machines and equipment; all certificates for the removed equipment should be deleted and newly received equipment recorded. If, for some reason, when taking the inventory, equipment is discovered that is not in the record, proper documents should be filled out for it. All actually worthless equipment should be written off by the inventory date.

Great responsibility for the timely and proper taking of the inventory is laid on the USSR TsSU organs which head all preparatory work on the inventory at the center, as well as at the locations that organize the collection of reports on the inventory results and work up the summaries. To cope successfully with this, it is necessary to develop, at each link of the state, statistical administration plans and schedules of measures on preparations for taking the inventory in which it is necessary to provide, in particular, measures for preparing lists of enterprises and organizations where the census will be taken; for providing them with the necessary forms and instructions; for directions to the personnel of ministries and departments, as well as enterprises and organizations in timely gathering of reports of the inventory summaries and the organization of checking the authenticity of the record data, etc.

All these measures must be thoroughly prepared in advance, taking into account the great amount of experience in carrying out such large amounts of work in the state statistical organs. Besides this, it is also necessary to take into account special features of the coming census and check the system thoroughly for providing enterprises and organizations with the necessary forms. It is very important to distribute them so that the inventory totals will include all equipment specified by the program. Here it is necessary to utilize the summaries of the inventory of machines and equipment that was done before the census. On the basis of the description list, it will not be difficult to determine what inventory forms will be needed by an enterprise for preparing records.



Instructing workers who will participate in the inventory taking is very important. It is necessary to get a thorough understanding of all the complexities of the inventory program and of the order of carrying it out. This should be done by a thorough study of the forms and instructions for taking the inventory; the use of available data in the statistical organs on current and annual reports on the number of organizations, the park of machines and equipment (form No 75-Tp, inventory of uninstalled equipment, etc), as well as contacts with participants in inventory taking at enterprises and organizations. It is very important that representatives of ministries and departments participate in the instructions.

Working up the inventory results is a very important moment. The program for this involves obtaining data summaries from ministries and departments by sectors of the national economy and industry in territorial profile. Considering the large volume of obtained data, it is necessary to determine beforehand the order of its handling and to use the available facilities for mechanized data processing for this purpose.

A large role in this will be played by the All Union "Soyuzmashinform" Association where the inventory results from the statistical administrations of the ASSR, krays and oblasts will be sent. The TsSU of the union republics will receive the data from the "Sovuzmashinform" according to the established program for the republic as a whole, the most important sectors of the national economy and industry, as well as ministries and departments. Computer centers, RIVS [Rayon Computer Center] and GIVS [City Computer Center] must be involved in the work primarily at the stages of preparing lists of enterprises and organizations, and gathering and monitoring the reports.

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## INDUSTRY PLANNING AND ECONOMICS

### VARIABLE WORK, PAY STRUCTURE IN AUTOMATED PRODUCTION FACILITIES

Moscow MASHINOSTROITEL' in Russian No 11, Nov 83 pp 3-4

[Article by Engineer A. Ye. Fertman: "Automated Production Reserves"]

[Text] The bearings industry is one of the most highly automated sectors: more than 2,000 automatic lines have been installed at no more than 20 plants. Ensuring the uninterrupted work of the equipment requires the efficient interaction among all enterprise services and extensive knowledge of mechanics, energetics and electrical engineering on the part of the servicing personnel. Practical experience indicates that comprehensively regulated servicing is the most efficient system for ensuring the efficient work of the technological equipment. It consists of the comprehensive servicing of work places and equipment at strictly specified times and in accordance with established sequences.

The Minsk branch of the VNIIPP [All-Union Scientific Research Bearings Industry Institute] drafted a "Standard Scheme for the Organization of Regulated Servicing of Automatic Lathe and Milling Lines." The scheme pays particular attention to repair services, quality control, instrument availability and the labor organization of basic workers.

The complexity of the operation and the interdependence of the machine tools within the automatic line demand the unified efforts of people of different skills and qualifications. This requirement is met most completely by the brigade labor organization method the application of which enhances reciprocal control and collective responsibility for joint labor results. However, the consideration of nothing but collective labor results personalizes the individual efforts of the workers and worsens the psychological climate in the brigade. That is why establishing properly planned relations among brigade members, their hierarchical subordination and the application of a system for recording individual contributions to the implementation of planned indicators are major aspects of cooperated labor.

The labor contribution of the brigade member is assessed with the help of the KTU [Labor Participation Coefficient], the basic value of which is the average daily worker output for a month or the average percentage of fulfillment of the normed shift assignment. If an assignment has been met 100 percent the  $KTU = 1$ ;  $KTU = 1.05$  if the assignment has been fulfilled 105 percent; and so on. The final value of the KTU is determined at the general meeting or the conference of the brigade council on the basis of the following factors:

the quality of passing on the equipment from one shift to another; the rhythmical implementation of shift assignments for the month; observance of equipment safety regulations and production standards; producing goods on the stipulated quality level; observing technological discipline and equipment operation regulations, and so on. Subsequently, the final value of the KTU is determined when the brigade wage fund and bonuses are paid out.

The brigade is headed by a brigade leader appointed by the shop chief who has taken into consideration the view of the general worker meeting. In the case of large brigades, or when workers working on different shifts are members of a single brigade, assistant brigade leaders (link leaders) are appointed. The basic requirement in setting up a brigade is the existence of a common indicator the fulfillment of which determines the labor results of the collective as a whole and the individual members. The daily 5-minute conferences before the start of the first shift, at which brigade work results for the past 2 1/2 hours are considered, job assignments are issued, problems related to securing work to the following shift are clarified and work omissions are pointed out, help the brigade leader to unify the workers, who previously worked on an individual basis, within a single production collective. At the end of the month a general brigade meeting is held at which monthly work results are summed up and the efforts of the individual worker are assessed.

The introduction of the new forms of labor organization leads to changes in the organization of wages and material incentives. Thus, a special regulation on wages paid to brigade members working on a single order, based on the final operation, was drafted at the GPZ [State Bearings Plant]-16. The brigade wage consists of the value of the normed assignment and bonuses for quality, fulfillment of the brigade plan and fulfillment of assignments on reducing labor-intensiveness and increasing labor productivity.

The value of the normed brigade assignment is formed by summing up the assessed cost of the operations stipulated in the technological process on the basis of which the brigade operates and is amended in accordance with the stage reached in meeting the estimated technical production norm. A diagram which shows changes in the normed assignment, its value and the bonuses is prominently exhibited in the shop. In determining the value at the final stage the supplement to the evaluation for having reached the estimated technical time norm (output) is taken into consideration.

The numerical and skill structure of brigades servicing automated lines is defined on the basis of operational conditions, the work system, the structural features of the equipment, the specifics of the production process, the servicing norms and the territorial location of the automated lines. Practical experience acquired by many GPZ has indicated that the most acceptable form of work in automated production is that of all-round brigades in which all the equipment has a single owner--the brigade. This contributes to the more efficient utilization of the machines and ensures the transfer of automated lines from one shift to another in working condition, as well as efficient handling under adverse production situations, including withdrawal of equipment for repair.

In forming a brigade particular attention is paid to defining the final operation on the basis of which the labor results of the entire collectives are assessed. Let us note that the brigade is not a frozen organizational form but a continually improving production system.

For example, initially individual brigades were set up at the automatic grinding lines shop of GPZ-16. They were assigned the machining of the outside and inside ring; the plain and centerless grinding machines were serviced by a specialized brigade which supplied the necessary parts to all work flows. The brigade serviced a limited variety of tools and, on the basis of his professional training, if necessary the individual member could operate most of them. Interchangeability in such brigades is high. This has a positive effect on doing extensive amounts of work in starting or tuning the equipment. However, the brigade is not directly interested in manufacturing rings of the specific variety needed for subsequent production operations; it could carry out its assignment without having an even workload by overfulfilling its plan for the more profitable items.

That is why a reorganization was made: workers from the individual brigades were reassigned to specialized brigades servicing the automated lines in which the machining of the rings was completed. However, even this is not a definitive solution, for the territorial location of the automated lines for machining external and internal rings makes it possible to create brigades the end result of whose labor will be the delivery to the assembly section of the external and internal rings as a set. This will enable us to reduce the above-norm stock of unfinished production and to avoid the additional cost of lengthy storing of the parts.

One of the main factors in intensifying the growth of labor productivity in automated production is to reduce equipment idling during repairs, for this entails considerable intrashift working time losses.

The repair of automated lines is rated as servicing one-of-a-kind equipment, the unplanned stoppage of which could prevent the plant from fulfilling its planned assignment. Therefore, all the various types of repairs and inter-repair servicing of the equipment machine units within the automated lines are carried out by specialized brigades. According to the type of repairs and the nature of operations the repair personnel is organized within brigades for interrepairs servicing, planned-preventive repairs and repair preparations and backup.

The interrepair servicing brigade includes fitters-repairmen and electricians. In a two-shift work system the main personnel of the repair brigade works in three shifts: two are in charge of day-to-day servicing and one carries out repair-building operations. Furthermore, together with the basic workers the brigade must control the technical condition of assemblies and machine units.

A special logbook is kept on deviations in the work of the equipment which do not require immediate interruption of the work but cause drops in productivity and may result in major breakdowns. The repair brigade determines the



technical condition of the automated lines and the observance of operational regulations. Specially drafted technical servicing charts indicate the periodicity and nature of preventive examinations. On the basis of the logbook, together with the head of the repair service, the brigade leader plans the work of the brigade for the shift or the entire day and notes the shortage of spare parts needed to maintain the equipment in working condition.

The idling of automated lines is recorded in order to determine the quality of the work of the repair personnel and to obtain statistical data on the breakdown of parts, assemblies and machine units, so that their prompt replacement may be anticipated.

The brigade leader (tuner) records equipment breakdowns in a special logbook kept at the work bench of the production foreman. After recording the time and reason for the idling of the line the light signal toggle switch is turned on (in the absence of ASU [Automatic Control System]), which is found in the foreman's booth and which is duplicated at the automatic line and the repair service. After correcting the malfunction, the repairman on duty enters in the logbook the time of completion and turns off the toggle switch. If another entry on idling has been made in the journal, the light signal is kept on until that request has been met as well. At the end of the month data on the reasons for the unserviceability of the automatic line are recorded in the cumulative report on unplanned repairs and information on the idling is submitted to the shop norming worker for purposes of determining the bonus percentage of the wages paid to the repair brigade.

On the basis of data acquired through statistical observations or provided by the Repair Analysis and Planning Bureau, the chief mechanic's department (OGM) and the department of the chief power worker (OGE) draft a plan for replacing fast-wearing parts, which they submit to the shop which will prepare and replace the parts (assemblies) as they wear out.

The amount of plan prevention and repair operations and their periodicity and sequence are regulated on the basis of an annual schedule issued by the OGM and OGE. The brigade in charge of planned preventive repairs includes, in addition to fitter-repair workers and electricians, a brigade leader and link leaders of the main production personnel working along that line. Two months prior to withdrawing the line for planned repairs a defects form is filled, in which all parts (assemblies) to be replaced or rebuilt, the required number of parts and their actual availability are recorded.

In order to control the course of the forthcoming repair, the manager of the shop repair service submits to the departments and shops which supply the spare parts an excerpt of the defects form. The course of the manufacturing (acquisition) of complementing parts is controlled on a weekly basis at the conference conducted by the deputy chief of shop in charge of technical affairs. Current control over the course and quality of repair operations is provided by OGM and OGE inspectors. The head of the interrepair servicing brigade accepts the repaired automated line in the presence of representatives of the plant repair services inspectors' group. The line is put into operation after the assemblies and machine units have worked steadily over a

three-shift period and the goods produced have met the stipulated quality requirements in accordance with existing output norms. The quality of the planned preventive repair is approved by the observance of the guaranteed period of work of the repaired line. It is considered successful if during the first 2 months after the line has been delivered for work idling for unplanned repairs accounts for no more than 30 percent of the normed idling of equipment not subjected to planned repairs.

A guarantee stub is issued for the submission of quality repair claims, indicating the guaranteed period of failure-free performance. After the period of the guarantee has elapsed the mechanic notes in the stub the actual idling of the line for interrepair servicing and delivers it to the labor-norming bureau for determining the bonus earned by the PPR brigade.

The parts needed for the repairs come from three different sources: parts manufactured at other plants, parts procured on a centralized basis and parts manufactured by the plant's machine repair shop or the repair center servicing the specific shop.

Parts are procured on a centralized basis through the OGM and OGE, based on shop requests in accordance with stipulated ceilings. The amount of manufactured parts by the machine tool base servicing the shop is established on a monthly basis by the manager of the repair service in coordination with the OGM and OGE. In addition to the machine tool workers, the repair brigades include fitters-repair workers who check and rebuild assemblies to be replaced in accordance with the plan for replacing rapidly worn-out parts and in the course of planned preventive repairs. The parts manufactured on a planned basis are delivered to the warehouse of the repair base. The availability of complementing equipment parts is based on control over the minimal stock needed for the normal functioning of the equipment from the time parts have been requested to the time they have been completed and delivered to the warehouse where they are kept under supervised storage (i.e., after issuing the parts the storeman must file a request for the manufacturing of a new batch).

Particular attention is paid to the organization of quality control of parts manufactured on the basis of an assembly-line automated cycle. This problem is resolved through the active-preventive control of the technological process based on statistical control over the manufacturing of the item, provided by the OTK [Technical Control Department]. During the period of the shift the controller checks the equipment assigned to him in accordance with the established itinerary and selectively examines the machined parts. The control data are entered in cards placed by each machine tool. The supervised parameters are classified into three areas: nominal, preventive and write-off.

If the parameter falls in the preventive zone the controller must inform the store man of the need for supplying the machine tool (noted in the card). If a defect is discovered in the subsequent examination, all parts manufactured in the period between two examinations are considered defective and payment for them is refused; the processed batch is considered delivered after a

claim. The quality of work of the worker is determined on a monthly basis according to the results of such control, which determines his KTU.

The organizational steps indicated in this article are a structural component of the "Standard Plan for Comprehensive Regulated Servicing of Machining and Grinding Automated Lines," used at the GPZ-10, GPZ-16 and GPZ-23. They have helped to reduce intrashift working time losses, increased the work stability of the equipment, improved the quality of output by 8-10 percent and enhanced labor productivity.

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## INDUSTRY PLANNING AND ECONOMICS

### LOW PRODUCTIVITY AT BELORUSSIAN TRACTOR PLANT DUE TO SHORTAGES, LAXITY

#### Bonuses Follow Punishment

Minsk SOVETSKAYA BELORUSSIYA in Russian 13 Dec 83 p 2

[Article by 'Social Inspection Brigade': "Rewards Following Punishment"; passages in all capital letters rendered in boldface in source]

[Text] THE MOST RECENT SOCIAL INSPECTION TOOK PLACE AT THE BOBRUYSK TRACTOR PARTS AND ASSEMBLIES PLANT. PARTICIPANTS: YE. A. ARZAMAZOV, BRIGADE LEADER OF THE THIRD MACHINE SECTOR; M. I. MARGOLIN, ADJUSTER IN THE SCREWSTOCK SECTOR; YU. A. CHERNYSHEV, BRIGADE LEADER OF ASSEMBLY WORK INSPECTORS; N. B. SHKODA, BRIGADE LEADER OF THE THERMOGALVANIC SECTOR; N. K. PODOLYAKIN, CHIEF, QUALITY CONTROL DEPARTMENT, BOBRUYSK TRACTOR PARTS AND ASSEMBLIES PLANT; AND V. I. ZHARIKOV, SOVETSKAYA BELORUSSIYA CORRESPONDENT.

IT WAS NOT BY CHANCE THAT THE INSPECTION WAS CARRIED OUT AT THE BOBRUYSK TRACTOR PARTS AND ASSEMBLIES PLANT. IT WAS INSPIRED BY A LETTER TO THE EDITOR OF SOVETSKAYA BELORUSSIYA FROM WORKER V. N. SAKOVICH DESCRIBING A NUMBER OF SERIOUS SHORTCOMINGS IN THE ORGANIZATION OF SOCIALIST COMPETITION AT THE ENTERPRISE AND THE ADMINISTRATION'S LIBERAL TREATMENT OF VIOLATORS OF LABOR DISCIPLINE, RESULTING IN HEAVY LOSSES OF WORKING TIME, DEFECTIVE OUTPUT AND DOWNTIME.

AND MANY OF THE WORKER'S CRITICISMS HAVE INDEED BEEN CONFIRMED. COMPARED WITH THE PREVIOUS YEAR, IN THE PAST 11 MONTHS THERE HAS BEEN A CONSIDERABLE INCREASE IN ABSENTEEISM, DRUNKENNESS ON THE JOB, AND IN DEFECTIVE OUTPUT; THE DEGREE TO WHICH THE EQUIPMENT IS UTILIZED AND THE NUMBER OF SHIFTS IN WHICH IT IS OPERATED ARE LOW (ON THE AVERAGE, 0.87 AND 1.41, RESPECTIVELY).

ACCORDINGLY, THE SOCIAL INSPECTION BRIGADE SET OUT TO DETERMINE THE FACTORS BEHIND THE NEGATIVE TRENDS AND TO FIND ANSWERS TO QUESTIONS, THE FIRST OF WHICH WAS:

#### WHY DO THE MACHINES STAND IDLE?

We became convinced that many equipment units stand idle for long periods of time in virtually all five major production sectors. Idle time is greatest in the first machine sector where machine tools are operated in only one shift.



"There are a number of reasons for this," explains B. G. Polyak, the chief of the plant's engineering department. "But the most important factor is the lack of blanks for certain types of products and also the type of production we are involved in. We have special machine tools that can only perform certain operations."

Brigade leader N. K. Mirutko joined in the conversation: "Two months have gone by since we put together a specialized brigade to produce a tractor power shaft. Since the seventeenth of November, 15 people and 20 machines have been standing idle. And all because we don't have the metal that should be supplied to us by our association's head enterprise: the Minsk Tractor Plant. We already have a shortfall of 10,000 important parts in our output quota."

Unfortunately, disruptions in the supply system are not the only reasons the equipment stands idle. A photographic study of a work day at the plant revealed that nonproductive and, for the most part, undetected losses of working time accounted for about 13 percent of all lost work time, and in the first machine sector exceeded 17 percent.

"From the morning on, we simply waste time because we aren't given the work to do," explains drill operator A. N. Tsvetkova. "Sometimes we have to spend a whole half-day doing nothing and no one pays any attention, but then later on, of course, we have to work very hard and fast to make up for it."

Other workers also spoke of the lack of organization. Thus in V. A. Aleksin's brigade, nonproductive losses of working time were 22.4 percent. Where did 2 hours in the shift vanish? It turned out that they were taken up with searching for packaging materials, with carrying up blanks, with downtime due to the lack of compressed air. Another factor in the loss of this time was low labor discipline: tardiness, early lunch breaks, leaving before the shift was over, and idle chatter.

The sharpening division of the tool sector holds the record for such losses (about 40 percent). The division does not even have a production target. Between 50 and 90 minutes, i. e., as much as one-fourth of a shift, are lost on sharpening and replacing a tool. Sector foremen and plant specialists pay little attention to improving the organization of labor.

All this has a negative impact on the level of labor and production discipline. Since people know that there will inevitably be downtime from the morning on, many do not show up for work in time. Thus, for example, on 5 December five people were late for work in the first sector and six persons were late in the third sector.

It was found that is common practice of workers belonging to brigades headed by V. A. Aleksin, I. P. Mikhaylovskiy, E. I. Shunkevich, A. S. Yakubov, and a number of others, to leave work 30-40 minutes before quitting time. Characteristically, the leaders of the primary collectives do not always set a good example in following the daily work routine, thereby contributing to the lack of organization that is the principal reason behind equipment idle time and lost working time and that also affects other aspects of the collectives' activity. Production discipline is affected above all.

A reading of the monthly bulletins issued by the plant's quality control division immediately reveals a stable trend toward higher losses due to defective output. The second question that was analyzed by our social inspection brigade was:

#### WHO IS TO BLAME FOR THE INCREASE IN DEFECTIVE OUTPUT?

First, a few figures. Of the verified production operations involving deviations from the specifications, 20.8 percent were performed in the third machine sector and 10.8 percent were performed in the first machine sector. During 9 months of this year, losses due to defective output in the fourth sector exceeded 5000 rubles. Analysis of the records kept on defective output shows that the major reasons behind it are the careless, slipshod workmanship of those performing the given work operations (30.4 percent) and flaws in finishing work by masters and technicians (roughly 30 percent).

On the days that we conducted our inspections, our brigade witnessed specific instances of unconscientious attitudes toward labor in a number of sectors. Thus in N. K. Mirutko's brigade on 7 December, three workers ruined the parts on which they were working and tried to conceal the obviously flawed parts from the quality control inspector. Entire technologically essential operations are frequently omitted in the quest for quantity. For example, assemblers did not tighten the nuts on the belt of a half-track tractor; V. D. Strelkov from the third sector welded parts before they were polished; grinder L. F. Komar submitted pieces whose dimensions deviated from the specifications; V. Yu. Andreyev submitted pieces that had not been entirely machined. A great many flawed pieces are produced by the brigade lead by V. A. Aleksin; what is more, the largest number of deviations from technological requirements according to the data for the last three months were committed by the brigade leader himself.

There are many factors at the plant that foster the principle "quantity at the price of quality." Owing to the lack of monitoring and recordkeeping on the machining of parts and operations performed (the worker's word is taken regarding output volume), spurious claims flourish here. Thus, in September of this year, the first sector was discovered to have falsely claimed to have produced more than 3000 parts; the third sector falsely claimed to have performed 178 rubles' worth of welding work; the fourth sector--to have produced 538 rubles' worth of parts, etc.

Lack of conscientiousness in the work and violations of production discipline that promote defective output are tolerated by many foremen. A large lot of defective products was produced because A. A. Kuznetsov, a foreman in the first sector, did not test the assemblies when he should have. Two technological operations (deburring and washing parts) are not performing owing to the slipshodness of the foremen. Production culture is low--the workplaces are dirty and cluttered; deadlines for submitting output are not met.

The shortage of measuring instruments, the fact that the drying chamber does not maintain the proper temperature, and the lack of interoperational

monitoring of parts, which characterizes the low level of work of the technological and other plant services do not have an optimal impact on product quality.

A significant reason behind the high level of defective output at the enterprise is that the guilty parties bear little material responsibility. Thus, for example, in October out of a total sum of 1173 rubles' worth of defective output, only 172 rubles were withheld from the pay of the guilty parties. Strange though it may be, the increase in the number of brigades at the plant has lowered the sense of responsibility for defective output. The fact of the matter is that some leaders of primary production units have taken it upon themselves to institute the principle of collective responsibility. Brigade leaders, without finding out who is responsible for defective output and without analyzing the causes, divide up the deficit among all workers in the brigade which then becomes scarcely noticeable. But this essentially creates an undemanding atmosphere, one that shields faulty workers at the expense of the diligent. This is particularly intolerable when the brigade leaders themselves more than anyone else receive complaints from quality control inspectors about deviations from the specifications, as is the case, for example, in V. A. Aleksin's brigade.

V. I. Bykov, secretary of the plant's party organization, stated that such shortcomings are temporary and easily eliminated. After all, as of 1 August the plant has instituted a comprehensive system of measures for combating drunkenness and violations of labor and technological discipline.

However it is hardly possible to agree with such optimism. The system has already been in operation 5 months and no reduction in losses can be seen. It is not by chance that the third question on our inspection brigade's agenda was:

#### WHY ISN'T THE COMPREHENSIVE SYSTEM WORKING?

The answer is in some measure suggested to letters to the editor of SOVETSKAYA BELORUSSIYA from worker V. N. Sakovich who described several serious irregularities. In particular, after the comprehensive system was put into operation, a social inspection devoted to the utilization of working time at the plant was held. Channels of losses were identified, names of specific discipline violators were cited and punitive measures were pronounced. But no sooner was the ink on the stern order dry than a new order was prepared. This one awarded certificates and bonuses to many of those who had just been punished. How can one speak of the power of educational influence following such mutually exclusive decisions?

Here is yet another instance. V. N. Sakovich appealed to the trade union committee and then to the plant's party bureau to investigate drunkenness in the workplace in the first machine sector. But they did not attach any significance to his appeal and took the senior foreman's word that everything was normal in all respects. The question of drunkards--male and female--was not discussed in good time in the collective.

But the situation here is far from optimal as can be seen in the following incident. On the last Monday in November, milling machine operator L. V.

Kazakevich came to work drunk. His foreman would not let him work, but instead assigned N. V. Sakovich to operate his machine. The drunk thereupon became abusive and threatened physical violence (lunged at a worker first with a hammer and then with a knife). But nonetheless the plant still puts up with this violator to this very day.

The discrepancy between words and actions--the compilation of a vast list of measures on paper and their nonfulfillment in practice--is also characteristic in the fight against defective output. After all, the same people who are punished for technological violations are often the very same ones who subsequently receive rewards. This entire process--both punishments and rewards--is carried out in camera without the participation of the primary collective. It is for this reason that their educational significance is lost. A good cause (the comprehensive system of measures) is emasculated and fails.

Formalism and shortcomings in the organization of socialist competition have a particularly negative impact. As many workers in the first sector noted, the winners and leading workers are selected without their participation; they frequently do not know the reason why their colleagues received a bonus. In a word, the sectors have not organized an efficient system of information on the fulfillment of pledges throughout the year. There is little publicity: only the leaders are named; nothing is said about the average or lagging workers. What is more, in the process of selecting leading workers such an important criterion as flawless work is frequently ignored. Hence it is not surprising that at the plant today a vast discrepancy has developed between the number of communist labor shock workers (518) and workers who have won the "Outstanding Quality" award (a mere 8 persons). And after all quality, like discipline, is an integral aspect of communist labor.

#### Reconditioning of Tractor Parts

Minsk SOVETSKAYA BELORUSSIYA in Russian 6 Dec 83 p 2

[Article by O. Kuz'menkov, candidate of technical sciences: "Problems of 'Small-Scale' Machinebuilding"]

[Text] A considerable percentage of tractor and other farm machinery parts wear out by mere tenths or even hundredths of a millimeter in the process of their operation. By restoring the necessary parameters, it is possible to prolong their service life considerably. Many organizations, including the VNPO [All-Union Science-Production Association] "Remdetal", and a number of research institutions and VUZ's, are today working on this important national economic problem of 'small-scale' machine building. As a result, new industrial techniques such as beading (including beading with a rocking electrode under flux, laser beading, gas-flame beading), plasma and detonation spraying of self-protective powder materials, plastic deformation, galvanic coatings, and others) have been developed and incorporated in repair technology.

It must be considered that only 3 to 20 percent of the parts of tractors undergoing major overhaul are totally discarded; 20-45 percent are suitable



for reuse; and 35-60 percent can be reused after reconditioning. The cited figures attest to the importance of the problem. We must in particular bridge the gap between "large-scale" and "small-scale" machine building and eliminate the great disproportion existing in the technical level of machine building plants and repair enterprises.

As Academician B. Ye. Paton stated in his report at the plenary sitting of a recent conference of CEMA countries ("Remdetal'-83"), a worn part should be regarded as a blank from which to make a new part. Indeed, what can be a better blank than one whose form already approximates the form of the finished product to the maximum? After all the biggest cost in producing a part is producing the blank. Moreover, the additional expenditures of metal are minimal. Such is the "secret" of the high effectiveness of producing spare parts from worn-out parts: experts estimate that 1 million rubles' worth of output will save 2000 tons of high-grade steel.

Metal-saving technologies include the restoration of the form and mechanical properties of worn-out parts by means of plastic deformation. In particular, a new direction in restoration technology, which specialists have tentatively named rotary plastic deformation, is winning more and more adherents. And not by chance--the simplicity and reliability of the technique, which as a rule does not require additional material, are attractive. To recondition a part in the blanking shop of a machine building enterprise--a forging, rolling, pressing or reconditioning shop--it is sufficient to heat the worn part and then to use a gear-rolling mill or press to force the metal from the nonworking zone to the wear zone. Such redistribution of the metal is accompanied by its rejuvenation, by the strengthening of the working part, by the "healing" of internal structural defects and by the restoration of its original form and dimensions with the margin required for subsequent machining. A group of scientists at the Institute of Problems of Machine Reliability and Service Life (INDMASH) of the BSSR Academy of Sciences has been working in this direction the last 10 years.

INDMASH scientists together with the "Sel'khoztekhpriyekt" institute of BSSR Goskomsel'khoztekhnika [BSSR State Committee for the Supply of Production Equipment for Agriculture], the Orshanskiy Tractor Repair Plant and the Borisovskiyy Automotive Repair Plant for the first time in repair practice developed and introduced processes for reconditioning transmission gears of the GAZ-51/53 motor vehicle by means of plastic deformation and hot knurling, a technique widely known in "large-scale" machine building.

New prospects for the wide application of plastic deformation open up in connection with the development of a whole series of component gear wheels by O. V. Berestnev, doctor of technical sciences, and his pupils at INDMASH, BSSR Academy of Sciences. The gear wheels are original in their design and have improved vibroacoustical properties and repairability. Such wheels are much easier to recondition than conventional ones because their gear rings are detachable. When reconditioning is in the form of plastic deformation, this feature makes possible a considerable reduction in labor- and energy-intensiveness in the process.

As is often the case, one good idea leads to another. So it was that the development and industrial application of component gear wheels with various kinds of shock absorbers paved the way for a new direction in conventional technology of reconditioning such parts by replacing the worn-out ring with a new one. The reconditioned transmission gears possess adaptive properties, are self-adjusting during operation and stand up to 20-30 percent more stress than their conventional counterpart. This reconditioning method has been given the name "bandaging" and is successfully used in repairing mining equipment.

Nonetheless the new direction in the reconditioning of worn parts by means of plastic deformation is having great difficulty making headway. There are many different reasons why. The most important among them is that the time has long been ripe to devise flexible methods for making economic evaluations of everything progressive that is introduced in repair practice everywhere--methods that would take into account the specific features of repair work. We cannot be reconciled to the situation described by Comrade Yu. V. Andropov: "A manager who takes a risk and introduces new technology at an enterprises, who uses or produces new equipment is often the loser while the one who shuns innovation loses nothing."

The existing methods for calculating the economic effectiveness of introducing new technology are very "helpful" in placing someone in such a position. These methods are oriented toward "large-scale" machine building with large-series and mass production and in our view are entirely unsuitable for repair enterprises with small-series and occasionally customized production. We must get rid of the fatal arithmetic that is presently used to calculate the effect of innovation in repair (the total effect is equal to the unit effect multiplied by the annual program), which has buried tens and even hundreds of valuable proposals by innovators and scientists. If a frequently meager unit effect is multiplied by a solid machine building program calculated in the hundreds of thousands and sometimes millions of units of items, the result is a solid general effect. In the repair industry, on the other hand, if a solid unit effect calculated in tens of rubles per unit of output is multiplied by a meager program, the result will also be a meager effect.

One does not have to go far to find an example. The introduction of the rotary plastic deformation as a means of reconditioning GAZ transmission gears at the Orshanskiy Plant (one of the leading plants in the branch) made it possible, according to the calculations of plant economists, to realize a saving of approximately 3 rubles per reconditioned gear. A fine indicator. The program is a small one--several thousand gears a year. The result is an overall effectiveness of 34,000 rubles. You will agree that this is not a large sum.

Someone might ask why we did not centralize the reconditioning of transmission gears at a single enterprise thereby making it possible to increase the program substantially and to realize the corresponding economic effect. Here is another important and unresolved problem of "small-scale" machine building -- the problem of the centralized collection

of worn parts--repair stock. This would seem to be a simple matter: if you want to obtain a new transmission gear, turn in a worn-out gear in exchange. However the organizational aspect of such exchange did not appeal to Goskonsel'khoztekhnika and to date there is only talk of the need to collect a massive stock of repair parts and to organize their industrial reconditioning.

The time has come to give Goskonsel'khoztekhnika exchange points and supply bases a material incentive to see to it that not a single repairable part would be scrapped but instead (after the condition of the part has been noted and the part has been marked) would be sent away to be reconditioned. The Nikolayevskaya raysel'khoztekhnika in the Ukraine has positive experience in this regard. It has devised the necessary incentive system--cash bonuses to those who collect parts. Heads of technical exchange points receive a 20-percent increase in their basic wage for fulfilling the quota for collecting repair stock.

Another seemingly simple way of increasing the economic effectiveness of introducing scientific innovations is to disseminate the new technologies to kindred repair enterprises. But this requires obtaining the "approval" of a departmental commission. One more unresolved problem of "small-scale" machine building is encountered here: the need to prepare and coordinate a repair blueprint of the reconditioned part with the head machine building plant (ZIL, GAZ, MAZ, MTZ, and others). Without such a blueprint, not a single commission is authorized to accept repair technology and equipment. How should a repair blueprint differ from the conventional blueprint of a part? In the opinion of machine builders, there should be no difference. Repair specialists, on the other hand, have a different opinion which we share completely: the repair blueprint must permit certain deviations in the form and dimensions of the nonworking surfaces of parts. For example, the end face of a gear ring and hub. The changes that form in the process of plastic deformation of the reconditioned part are permissible.

Disagreements over the form of the repair blueprint could be resolved in a very short time with the publication of an appropriate normative document--a GOST [all-union state standard] or interdepartmental specifications.

The experience of the Orshanskiy Plant, which prepared a new technology and a device to be submitted to a departmental commission back in 1980 speaks in favor of what has been said. Because the repair blueprint had not been coordinated with the head Gorkiy Automotive Plant, this device, which received a silver and two bronze medals at an international exhibit, to this day has not been submitted to an interdepartmental commission. All documents have been prepared, sent and are "marinating" somewhere. But BSSR Goskonsel'khoztekhnika has neglected the question of submitting the Orshanskiy device to a departmental commission as well as the question of reconstructing the Orshanskiy Tractor Repair Plant which has already been postponed more than 2 years.

Unfortunately the problems of "small-scale" machine building do not end here. The problem of supplying repair enterprises with series-produced forging, pressing and heating equipment is a source of serious concern. Anyone who has tried to obtain funds for such equipment, for repair plants knows that this is a difficult and sometimes hopeless matter. But without it, the industrialization of "small-scale" machine building is inconceivable.

The experience of the Orshanskiy Plant, which notwithstanding the noted difficulties, developed a new, progressive method for reconditioning worn transmission gears by means of rotary plastic deformation, is known to many repair enterprises in the nation. This point is attested to by the numerous requests and queries the plant receives from interested organizations. The question immediately arose: what of the equipment? Where can it be manufactured?

Most of the named (and unnamed) problems are essentially interbranch problems. An integrated all-union special program for the reconditioning of parts, in which more than 80 organizations belonging to various ministries and departments are participating, is presently being implemented for the purpose of resolving them. However I see no reason why BSSR Gosplan and BSSR Goskonsel'khoztekhnika could not examine the urgent problems of "small-scale" machine building in our republic in order to resolve them in the shortest possible time.

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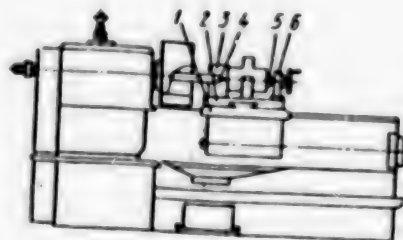
## OTHER METALWORKING EQUIPMENT

### NEW MACHINE IMPROVES ACCURACY OF DEEP HOLE DRILLING

Moscow MASHINOSTROITEL' in Russian No 10, Oct 83 p 20

#### [Article]

[Text] On the basis of screw-cutting lathe model 16K20 (1K62), equipment was devised to drill through holes 15 to 40 mm in diameter in housing parts of hydraulic apparatus by the method of deep drilling in one pass, as well as in all possible housing parts made of steel, cast iron and nonferrous metals. On carriage 1 are mounted fixture 2 for securing the machined parts, unit 3 for inserting drill 4, unit 6 for tightening the parts with sealing components 5 to prevent leakage of SOZh [Lubricating-Cooling Fluid] in the process of hole drilling. The spent fluid along with chips fall into the pan of the lathe, from where they proceed through a system of filters to a pumping installation.



Figure

Such an installation can drill long holes (with a length 5 and more times greater than the diameter) in one pass, and increase the productivity of labor 1.5 fold. The surface roughness  $R_a = 0.63$  micrometers, ovality and eccentricity of holes are 0.001 to 0.008 mm, and drilling precision is class 3. The annual economic effect is 6500 rubles.

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ADVANTAGES OF GROUP TECHNOLOGY IN BATCH PRODUCTION CITED

Moscow MASHINOSTROITEL' in Russian No 11, Nov 83 pp 12-13

[Article by engineers A. B. Bryukhanov, L. N. Rukina, and A. A. Bodryakov:  
"Numerical Control Machine Tools and Group Technology"]

[Text] The extensive introduction of group technology (GT) is indicative of the fact that a well thought-out grouping of parts and their manufacture in flexible production units offers economic advantages to factories engaged in experimental and small-batch production. However, the introduction of group technology requires the enterprise to introduce systems for the classification of workpieces and the accumulation of the necessary types of coding systems which take into account its specific features. There are different methods of selecting and classifying workpieces to obtain groups with similar machining features. However, all of them are referenced to the product range of the given enterprise or branch with a similar type of output.

When organizing production according to the group technology principle, in cases when it is not clear how to group the product range, it is recommended to make use of special classification systems based on numerical technological codes. This makes it possible not only to accelerate the fairly complex procedures of classification and performing the required computations, but also to use minicomputers for this. The sources of data in this case are the workpiece drawing and the manufacturing specifications.

Major opportunities for organizing group technology production are offered by numerical control (NC) machine tools, especially multiple tool ones. Automatic control of their tools makes it possible to machine virtually any surface shape for a minimal number of positions of the cutting tool, which substantially expands the machine tool's utilization rate for workpieces with identical machining technologies.

With due account for the capabilities of NC machine tools, when selecting the grouping criteria it is necessary to assume that:

Blanks subjected to the same machining process (same NC machine tool, fixture, tool assembly, geometric and adjustment dimensions of the cutting tool) should be referred to the same technological family regardless of surface geometry;

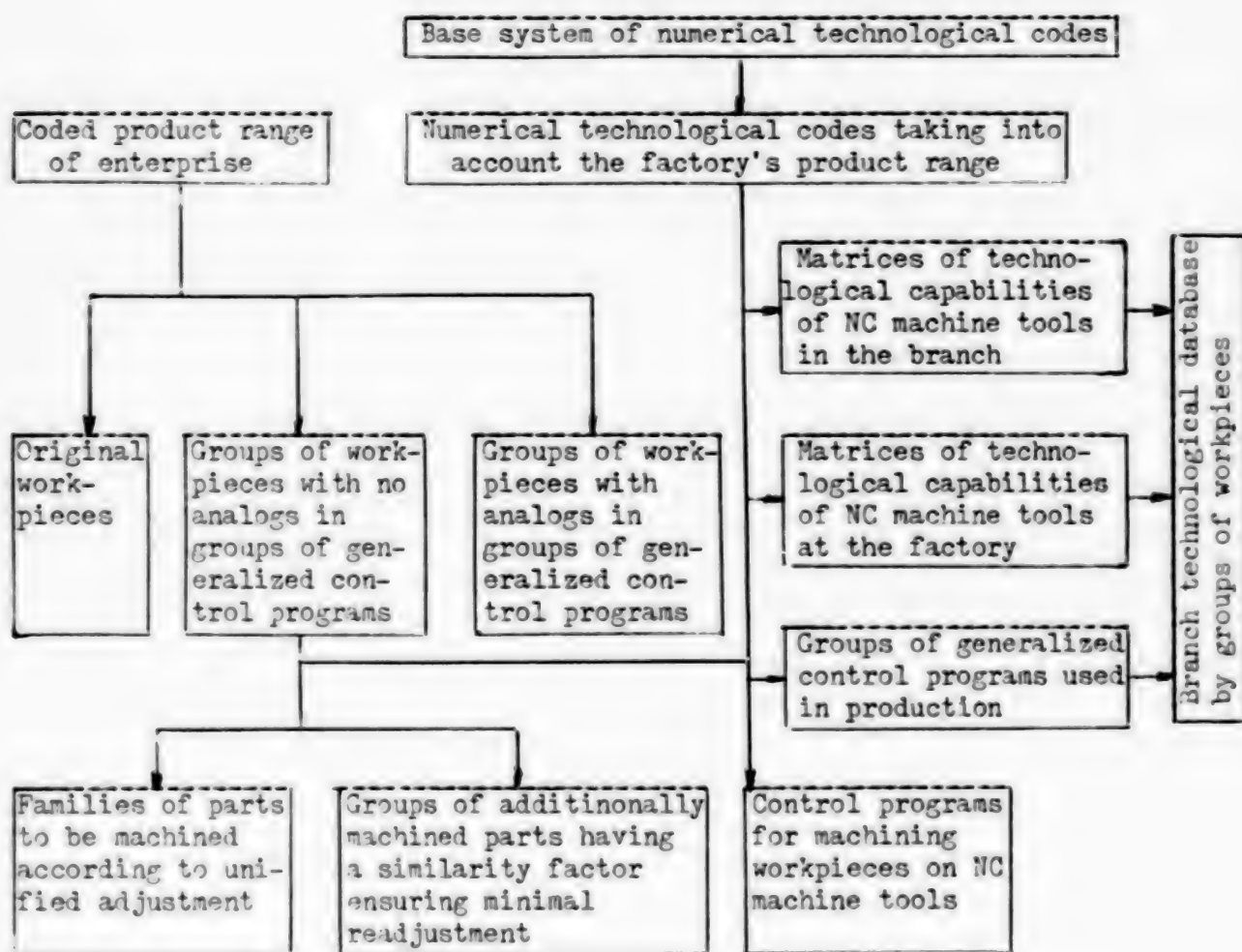
Within a family it is necessary to indicate groups which can use common control programs for the workpieces included in them (groups of generalized control programs). This requires adherence to such parameters as affinity of the range of machined dimensions, unified type of blank, sequence of tool transfers, number of passes when removing allowance, type and number of cutting tools in the tool unit according to the State Standard (GOST) and machining conditions. With the help of automated programming systems and given the availability of the relevant software, data on the machining of workpieces can be used to form groups of generalized control programs and stored as the factory's technological database. This will ensure on-line preparation of punched tape (data) for program control and guaranteed program input without adjustment according to trial introduction results. Furthermore, this will enable programmers with little experience to develop and introduce control programs for complex workpieces within reasonable deadlines.

The use of numerical technological codes in the development of group technology will make it possible to solve various problems in the sphere of technological preparation of production. The connections between the elements of the system are shown in the chart.

For the factories of an industry using NC machine tools, and especially those just introducing this expensive and highly productive equipment, it would probably be of interest to create databanks on machining conditions which would include, in the first place, combinations of cutting and hard-to-machine materials. It should be noted that there are numerous factors that affect machinability and the exact connections between them have still not been determined. The recommended empirical dependences and various tabulated norms are rather approximate and in practice difficult to apply to specific conditions. Solution of this problem will apparently require the accumulation of technological data developed in the course of production according to groups of generalized control programs. Exchanges of such information between enterprises will make it possible to specify applicability for other users.

To organize such exchange it would be useful to set up a database containing as many results as possible which would be capable of meeting requests. Data can be transmitted in the form of individual results for specific processes or a minibank. This will require feedback to expand the main databank and adjust it through the introduction of progressive processes.

Another equally important aspect is the possibility of accumulating this information directly in the data system of flexible metalworking production systems set up within the industry. This will raise their technical level and reduce the production preparation cycle and equipment downtime.



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CSO 1823/128



## AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

### BRIEFS

ROBOTIZED MACHINING CENTERS INSTALLED--In the Moscow factory "50 Years of the USSR" the program of technical renovation is being accomplished according to plan. A robot complex was set up there for manufacturing a variety of rollers; it consists of DNC turning machines equipped with manipulators. Considerable effort went into the creation of an automated machine tool complex for manufacturing complicated transmission case parts. Five manufacturing centers of the developing complex are already in operation. The application of DNC machine tools, automated complexes and industrial manipulators saves valuable time in setting up equipment and converting parts, increases manufacturing productivity and quality and makes it possible to introduce in the departments the more effective system of multi-machine operation. The Tass photo shows a section of the robot complex. The use of manipulator-equipped DNC machine tools makes it possible to operate three machines instead of two. [Text] [Tselinograd FREUNDSCHAFT in German 24 Jan 84 p 4] 9160

CSO: 1826/10

MODELS, NUMBERS OF ROBOTS AT VOLGA MOTOR VEHICLE PLANT VIEWED

Moscow AVTOMOBIL'NAYA PROMYSHLENNOST' in Russian No 1, Jan 84 p 30

[Article by V. V. Shlenov (Volga Motor Vehicle Plant imeni 50th Anniversary of the USSR): "Use of Robots and Robot-Technical Complexes"]

[Text] The extensive use of automatic manipulators (industrial robots) is a logical continuation of the policy of comprehensive automation on a qualitatively new basis. Problems of developing robots and equipping production with them are therefore given the most intense scrutiny at the VAZ.

The first step in this direction was the creation of a robot-making design department and a robot production shop, then mastering the release of MP-9S industrial robots (the first lot being produced in 1979).

"VAZ" robots are now being used by dozens of enterprises here, with bearing plants beginning to use them on a large scale (sectors consisting of 10-15 robots). It would not be an exaggeration to say that the MP-9S robot is currently the best-developed domestic model, with no equals in terms of numbers being produced. But VAZ specialists have not stopped at this: the experimental shop has already manufactured a batch of MP-11 two-armed robots with a load capacity of 1 kg.

The MP-9S and MP-11 robots were exhibited at the Budapest International Trade Fair in May 1983 and received good evaluations. The experience gained in developing them was a good base for setting up the production of welding robots which can be used in basic types of production: for welding in forging-assembly production and in aluminum casting shops in metallurgical production, where they can take on the difficult, monotonous work of welders and foundry workers.

About 20 robot-technical complexes based on the MP-9S, MP-11 and "Universal-15" robots are already being introduced for welding, casting and machining operations. For example, three robot-technical complexes have been put into operation in the starter-manufacturing shop. One, to automate press-fitting the armature and stock, permitted a 60-percent improvement in labor productivity, more stable output quality, the elimination of accidents and the elimination of monotonous manual labor in this particular operation.

A second complex, for machining starter drives, has three MP-9S robots and combines three pieces of technological equipment. Its introduction enabled us to

free for other work four persons (in a two-shift operation). A third complex (with one MP-9S robot) for assembling the starter cores has provided an opportunity to automate the complex process of assembling and press-fitting four parts and to free one person per shift for other work in this operation. Two MP-9S robots have been introduced in mechanical assembly in the synchronizer race hot-stamping sector. Three robot-technical complexes based on "Universal-15" robots have been introduced in metallurgical production to automate machine-proximate operations in the pressure-casting of aluminum.

In 1983, we began manufacturing several other robot-technical complexes for generator and starter production and forging-assembly production at the VAZ. These included ones with MP-11 robots for broaching the splines in starter ratchet gears; a complex with four MP-11 robots for machining starter spline bushings, connecting four units of technological equipment; a complex with an MP-11 robot to automate the welding of rear suspension shock-absorber supports after assembly; a complex with an MP-9S robot to automate the mounting and welding of assembled rear suspension crosspiece linkage boosters; two complexes with two MP-11 robots for weld-mounting the safety-belt buckle bracket; two complexes with three MP-11 robots to automate calibrating apertures and aligning the generator drive pulley, linking three units of technological equipment in the mechanical assembly production facility.

To ensure a systems approach to the development of robotization, the robot-technical complex design department, jointly with plant production facilities and the technical development administration, carefully analyzed the requirements of and opportunities in the production facilities. As applicable to the MP-9S, MP-11, "Universal-15", contact precision and arc welding robots and others, this analysis demonstrated opportunities for robotizing about 200 pieces of technological equipment. As a result, we now have a program for introducing robots at the motor vehicles plant to the year 1990. In the course of its implementation, MP-9S and MP-11 robots will be used to automate operations connected with the precision or relief welding of small parts at the forging-assembly facility and in the production of generators and starters, as well as machining, bending, spreading and assembly operations in the mechanical-assembly and auxiliary shops. The procedure proposed for loading blanks of various shapes into robot-technical complex bins or collectors after processing will be random, in most instances, but they will be selected and positioned by special devices or by the robots themselves. We have also proposed the development of both rigid and nonadjustable complexes for mass production and of complexes with rapidly replaceable tooling to machine parts produced in individual lots or small series but similar in type and size.

Experience in introducing the "Universal-15" industrial robot into metallurgical production has demonstrated their promise in servicing casting machines using chill molds and cleaning presses. At the same time, analysis has confirmed the need for robot modules with load capacities of up to 5 kg.

However, there are problems which must be solved in mastering this new equipment. These include the development of highly reliable domestic set-assembly devices, the development of reliable control systems, solving the problems of overcoming the "psychological barrier" when introducing industrial robots, including the development of proper methods for determining the economic effectiveness of robotization, without which its continued accelerated development is hard to imagine.

11052

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ROBOTIZED WELDING SYSTEMS, ANCILLARY EQUIPMENT SURVEYED

Moscow STROITEL'NIYE I DOROZHENIYE MASHINY in Russian No 12, Dec 83 pp 9-10

[Article by engineers V. B. Alekseyev (VPO "Soyuzstroy mashavtomatizatsiya," V. Kh. Rustanov (Bryansk VKTIstroydormash) and V. S. Ivanov (Minskstroydormash): "Robotization of Welding Production"]

[Text] The achieved level of automating welding production in the sector cannot be raised efficiently by traditional methods (universal welding automatic machines and automatic welding installations) which is explained by the large variety of parts, small series production and the complexity of the design of the manufactured welded units. Therefore, as shown by domestic and foreign experience, automation of welding production must be done by robotization.

One of the most important advantages of industrial robots is the possibility of readjustment from one type of product to another by changing the program. This makes it possible to use single type robot sets (RTK) for the automated welding of an entire group of products.

According to data from abroad, the replacement of manual arc welding by robotized welding, depending upon and the length and location of welded seams, reduces manufacturing time by 60 to 90 percent, improves considerably the quality of the welded joints and repeatability of final dimensions of products and makes it possible to weld in places difficult of access.

An investigation of welding production in the plants of the sector in order to get ready to change the technology to robotized welding indicated that in spite of the limitations imposed by existing industrial robots, 20 work positions are suitable for immediate equipment with arc welding RTK.

Such an RTK usually consists of a welding tool manipulator (the industrial robot proper), product manipulators, welding equipment and service devices (devices for cleaning the torches, cutting the end of the welding wire, etc.). An industrial robot for arc welding moves the welding torch along the welded seam, controls the technological mode and the auxiliary movement to and from the welded article.



The article manipulator operates in agreement with the welding robot and places the welded articles in the most convenient position for automatic welding. In individual cases (for example, in welding ring joints), the article manipulator moves the article while the welding torch is stationary.

Industrial robots of the first generation used in arc welding RTK have the best software which is necessary due to the requirements of the technological process: higher precision of positioning, strict observance of the vector contour velocity when moving along a complicated trajectory and the necessity of additional movement of the torch to improve the formation of the welded joint. Moreover, it must be possible to write programs by the training method which requires the presence of a skilled interpolator. Solutions of such problems are provided by specialized systems for contour programming of industrial robot control executed by microcomputers.

The use of arc welding RTK until recently was limited by the lack of a reliable means of technological and spatial adaptation of the welding torch that would compensate for random deviations of the welded joint parameters (position of the welding line, excessive edges). However, considerable progress is now noted in that direction. Several efficient systems developed were the adaptation to and the searching for the start of the seam. In spite of the fact that all these systems solve special problems of spatial adaptation as applied to specific types of welded seams, the use of even one of them makes it possible to expand by several times the number of articles, suitable for robotized welding.

Experience in using robots for arc welding indicated that their introduction is effective only in those cases where all the technological stages for manufacturing the products correspond to the technical level of the robot equipment being introduced, because the basic obstacle to their introduction is the low technical level of production. Moreover, constant operation of robotized systems demands well-organized and highly skilled technical servicing done, as a rule, by specialized subdivisions.

An efficient selection of welded structures is a determining condition for using arc welding RTK. Basic limitations on the product list of welded units are imposed by the functional possibilities of the industrial robots used for welding. An additional limitation is the economic efficiency of changing the unit to robotized welding. Taking into account the fact that industrial robots for arc welding are the most expensive and complicated devices for automating welding production, it is expedient to tie their use to welded structures whose automation by using simpler devices is impossible or very difficult. Such structures are products with a complicated spatial system of seams and with a large number of short seams.

The limited functional possibilities of modern industrial robots makes it possible to robotize primarily angular and T-shaped joints, which is due to the inefficiency of systems for linear adaptation along the line of the butt welded joint. In this connection, a rigid selection of parts that are being changed over to robotized welding is required. Deviations of the actual line

of the welded seam from the contour stored in the memory of the industrial robot should not exceed 0.5mm, otherwise a high quality welded seam cannot be guaranteed. Requirements of inadvertent deviations of the geometrical parameter of the seam from the designed ones are similar to those set for the automatic welding of structures.

To simplify the process of preparation for changing over to robotized welding the selection of objects for robotization are divided into several stages.

At the first stage, promising structures are classified based on the general machinebuilding technological classification modified as applied to robotized welding. The determining criterion is the geometrical shape of the article. According to this criterion, the following differentiations are made: girder, frame, housing, plane (grate), cylindrical and thin-sheet welded structures.

Within each group, a representative unit is selected which reflects more fully the group features of the welded units. A typical RTK arrangement is analyzed according to the representative unit for welding a given group of units; its versions are used for robotized welding of the remaining units of the group. Each unit is analyzed for suitability for industrial production for the purpose of raising the positioning precision of the welded seams, greater accuracy of basing and substituting welded joints unsuitable for robotized welding. The final decision on changing the unit to robotized welding is made after a technical-economic analysis of the new version is made taking into account - the importance of social factors.

Arc welding RTK may be a part of the welding sections, automatic and conveyor lines and may be the basis for unmanned production shops. The use of robots must proceed in sequence, therefore, we will consider the composition of single robot equipment cells with a closed technological cycle, designed to weld construction and machinebuilding products.

The arc welding RTK includes, besides the enumerated equipment, welding-assembly accessories installed on the product manipulators and designed to assemble the welding unit and its accurate fixing with respect to the assumed bases.

The welding-assembly accessories and product manipulators for various types of RTK are determined by the structure and dimensions of the unit being welded. For welding small and medium size products, multiposition rotary tables (positioners) product manipulators are used with welding-assembly fixtures mounted at each position. Articulated-balanced manipulators are used to mechanize the setting and remove products. Single-position assembly-welding fixtures are installed on manipulators. In this case, the robot services several work positions in turn. Small and medium size units are assembled directly on the RTK, while large size units are fed to the RTK being preliminarily assembled in clamps.

The number of degrees of mobility of the product manipulators depends on the complexity of the unit. Manipulators can have continuous programed control

directly from the robot control system, but, in this case, they must be equipped with a drive similar in accuracy to the robot drive and supplied in a set with the robot. Very frequently, the auxiliary welding equipment has a cyclic system of programmed control and is connected with the robot control system by discrete communications channels.

The widest assortment of product manipulators was developed by the ESAB firm (Sweden) which manufactures arc welding RTK based on the well-known IRB industrial robots by the ASEA firm (Sweden).

Insufficient domestic experience in developing arc welding RTK, low use and scarcity of arc welding robots make it impossible to begin directly the design and introduction of robotized welding sections and more so of welding shops.

So far, it appears expedient to concentrate efforts on the first stage of robotizing arc welding, i.e., on using typical robotized complexes which include RTK to assemble and weld small units, RTK for welding girders and frame structures and RTK for flat structures.

The readjustability and flexibility of individual RTK make it possible to change them over rapidly for different type of units, while the use of modern industrial robots provide high productivity. The integration principle, developed in modern robot equipment, assumes performing most of the welding operations at a single work position, without rebasing and transporting the unit. This makes it possible to increase productivity of a subdivision by increasing the number of robots operating in parallel. The creation of robotized parallel action welding sections using RTK with full integration of operations will be the second stage in introducing robot equipment in the sector.

The third stage will be the development of the introduction in production, on the basis of the obtained experience, robotized sections, shops and production facilities, basic and ancillary with group control of robots and with universal technological and auxiliary equipment.

The comprehensive solution of the automation of transport loading and technological operations will make it possible to identify fully the possibilities of robot equipment and obtain considerable social-economic effect.

Such robotized shops in their possibilities will be close to the flexible automated production facilities that can be readjusted rapidly to produce new kinds of products.

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